STATEMENT OF WORK (SOW)

FOR THE EOS/METSAT INTEGRATED PROGRAMS

AMSU-A INSTRUMENT

REVISED OCTOBER 2000

GODDARD SPACE FLIGHT CENTER
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GREENBELT, MARYLAND

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AMSU-A INSTRUMENT

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INTRODUCTION

This Statement of Work (SOW) is revised to add the work necessary to supply additional Advanced Microwave Sounding Unit-A (AMSU-A) instruments that are compatible with the NOAA Meteorological Satellites (METSAT) spacecraft. This new work is in addition to the original work necessary to supply AMSU-A instrument(s) for the Earth Observing System (EOS) PM spacecraft.

1.0 SCOPE

1.1 EOS SCOPE

In accordance with the requirements of Specification S-480-80, the contractor shall provide the personnel, materials, equipment, and facilities necessary for design, analysis, development, fabrication, assembly, testing, calibration, qualification, acceptance, storage, storage testing, and support for spacecraft integration and launch of AMSU-A Proto-Flight Model (PFM). Various analytical models and test models are required. The effort includes ground support equipment and test and calibration equipment. It also includes a Design Concept Review instrument delivery, storage, post-delivery bench testing, spacecraft integration support, pre-launch and post-launch support. Reporting, reviews and documentation of all aspects of the program are required. The deliverable EOS AMSU-A instrument is a PFM and optional Flight Model (FM).

AMSU-A is planned for flight on the EOS PM spacecraft. AMSU-A shall be compatible with the EOS PM spacecraft interfaces, and shall meet the in-orbit lifetime requirement of 3 years with a goal of 5 years without in-orbit servicing.

The program phase leading to delivery of the PFM shall be referred to as the "Basic Phase" and shall be subdivided into two sub-phases, the "Support Phase" and the "Implementation Phase." The Support Phase shall provide technical and program management support to address: (1) the evolving spacecraft interfaces, (2) special instrument studies and (3) program planning for the Implementation Phase. The Implementation Phase shall include the design, fabrication, assembly, testing and delivery of the PFM and shall start with a program initiation meeting.

1.2 METSAT SCOPE

In accordance with the requirements of Specification S-480-

80, the contractor shall provide the personnel, materials, equipment, and facilities necessary for redesign (if necessary), analysis, development, fabrication, assembly, testing, calibration, qualification, acceptance, and support for spacecraft integration and launch of METSAT AMSU-A FM instruments.

Development of the METSAT AMSU-A instrument will be conducted in four technical phases. Phase 1 shall be an assessment to determine what areas of the METSAT instrument require redesign.
Obsolete components are to be replaced by new components only after design analysis has been performed and margins are analytically demonstrated. Improvements that have heritage in the EOS AMSU-A instrument shall be considered and presented to the Government for approval. Phase 2 shall make an assessment of all drawings, procurements specifications, manufacturing flows, shop orders, test fixtures, test equipment and test procedures in order to identify areas that are deficient and/or require upgrades. Phase 3 will accomplish those items identified as a result of Phases 1 and 2. Phase 4 is the implementation phase which includes the fabrication, test and calibration of the METSAT instruments.

2.0 REQUIREMENTS

The AMSU-A requirements are defined in this SOW, the EOS/METSAT Instrument Specification S-480-80, and include documents referenced in the specification. The organization of this SOW corresponds to the Level 2 organization of the Work Breakdown Structure (WBS).

2.1 PROGRAM MANAGEMENT

The contractor shall maintain a combined project office which provides technical and resource management of the project. This office shall be directed by a dedicated project manager. This office shall provide the support staff required for schedule control and reporting, financial control and reporting, subcontract management, configuration management and documentation, progress reports and reviews, documentation, and implementation of the Performance Measurement System (PMS) in accordance with Goddard Handbook (GHB) 5112.1.

The contractor shall segregate, track and report the EOS and METSAT work efforts in accordance with the WBS. Documentation shall be developed and delivered in accordance with the Contract Data Requirements List (CDRL).

2.1.1 Project Planning

The contractor shall initiate his effort by conducting a distinct project planning effort. This shall include a development of a detailed project organization chart, the development of a detailed WBS, the development of specific work packages, the establishment of master and near term schedules, and the establishment of the baseline for the implementation of the PMS. This effort shall be completed prior to the PMS compliance review and shall be documented in the "Project Plan".

As a guideline, no lowest level work package should be larger than $500K, and that measurable tasks within the work package should be no larger than $50K. Except for level of effort tasks, each work package shall include milestone periods no larger than one month. Level of effort in this contract shall not exceed 25% of the contract labor cost with a goal of 15%.

If desired, the contractor can plan to use the METSAT Engineering Model instrument to support early checkout of new components and subsystems. Planning related to risk mitigation using the Engineering Model must include a time phased activities flow, an explanation of the purpose of the each activity and an explanation of the benefit to program risk reduction. The plan must also allow for the reassembly of the Engineering Model and provide all necessary retesting to make it acceptable for spacecraft support in accordance with paragraph 2.12c of the SOW.

2.1.2 Schedule Reporting

Schedules reporting shall be in accordance with the CDRL.

2.1.3 Reporting Requirements

2.1.3.1 Type 1 Monthly Progress Reports - The following report shall be prepared in accordance with the requirements of Specification S-250-P-1C (March 1972), titled “Contractor Prepared Monthly, Periodic, and Final Reports.” As a minimum, the report shall describe the previous month’s accomplishments, compare planning versus accomplished activities, and list the expected accomplishments for the next month. These accomplishments shall correlate with the Network Schedule Milestones. Particular attention shall be directed toward scheduling and cost problems, including:

(a) The nature and reason for the problem.

(b) The effects on the overall schedule, the critical path, and/or end item deliveries.

(c) Trade-offs and workarounds to minimize schedule and cost impact.

(d) Corrective action regarding cost and schedule variance.

This report shall include discussion, as appropriate, of the performance assurance requirements. Reports are to be delivered in accordance with the CDRL.

2.1.3.2 WBS - The WBS identified in Attachment B of the contract shall provide the basis for all PMS reporting. During the life of this contract, the WBS diagram and supporting summary task descriptions shall be updated by the contractor to reflect negotiations, new work, modification/changes, changes in work element distribution, and configuration changes.

The contractor's revisions to the baseline WBS shall be incorporated in the summary task description, shop order listing, and progress reporting within 30 days after WBS revision approval. Such updating and changes shall be accomplished in accordance with GHB 7120.1 "Handbook for Preparation and Implementation of Work Breakdown Structures."

2.2 INSTRUMENT SYSTEMS ENGINEERING

The contractor shall provide the following systems engineering work efforts: (paragraphs a, b & c apply to the EOS instruments. Paragraphs d, e, & f apply to the METSAT/METOP instruments.)

(a) The contractor shall provide the personnel and facilities necessary for the system engineering effort, which shall encompass all aspects of instrument design, performance, testing (unless specifically excluded, testing includes calibration) and evaluation. This activity includes system and subsystem requirements definition, test and calibration requirements definition, breadboarding, life testing, and generation or review of various plans and procedures. It includes end-to-end test data system requirements definition from within the instrument to the Instrument Ground Support Equipment (IGSE), via the spacecraft, when present, and EOS Data and Information System (EOSDIS), when present, as well as from within the instrument to a recording medium for subsequent distribution to EOSDIS. It includes instrument integration and testing support, test data analyses, generation of reports and specifications, control of internal instrument interfaces, and control of the instrument side of interfaces to the spacecraft. It includes generation of other technical reports, response to action items from design reviews, reissued reports, contractor internal technical memoranda, and support of storage testing.

(b) The system engineering effort shall address all considerations necessary to meet the Specification S-480-80, including electrical, structural, mechanical, thermal, calibration, and data subsystems, as well as interfaces within the instrument and between the instrument and the spacecraft. This effort includes performing analyses, and generating overall (top-level) system and subsystem error budgets. It includes maintaining updated error budgets as well as mass, power, and weight budgets and margins. It includes testing of the thermal and mechanical designs and breadboarding and testing of the electrical designs. It includes providing inputs to the spacecraft contractor to prepare the AMSU-A Interface Control Document (ICD), and the review and refinement of the ICD at several stages during the instrument development program. It includes reporting the status and progress of the system engineering work. It includes generation of performance and verification procedures as required in the Performance Assurance Requirements Document. It includes performing a Failure Modes Effect Analysis (FMEA). An FMEA provides insight into the severity and effect of each design failure mode. It can be used in design tradeoff studies. It also provides background for mission operations contingency planning.

(c) The contractor shall provide the personnel and facilities necessary for the design, fabrication and testing of models and components which are necessary to verify that the design meets the requirements of Specification S-480- 80, or to facilitate the integration of the instrument with the spacecraft. Models shall include structural math models, thermal math models, and a radiometric math model(s).

(d) The contractor shall provide the personnel and facilities necessary for the system engineering effort, which shall encompass all aspects of METSAT instrument redesign (if necessary), performance verification, testing, calibration and evaluation. It includes instrument integration and testing support, test data analyses, generation of reports and specifications, control of internal instrument interfaces, and control of the instrument side of interfaces to the spacecraft. It includes generation of other technical reports, response to action items from design reviews, reissued reports and contractor internal technical memoranda.

(e) The system engineering effort shall address all considerations necessary to meet the Specification S-480-80, including electrical, structural, mechanical,

thermal, calibration, and data subsystems, as well as interfaces within the instrument and between the instrument and the TIROS/METOP spacecraft. It includes maintaining updated error budgets as well as mass, power, and weight budgets and margins.

(f) The contractor shall provide the personnel and facilities necessary for the update of analytical AMSU-A models and components which are necessary to verify that the design meets the requirements of Specification S-480-80, or to facilitate the integration of the instrument with the spacecraft. Models include structural math models, and thermal math models. These models are upgrades/revisions to those developed under NAS5-29402 contract.

(g) At least one AMSU-A unit shall utilize an alternative PLLO, i.e., 1 of the 2 PLLOs will be of Aerojet baseline design and the other will be an alternative design.

2.3 EOS PROTO-FLIGHT MODEL

(a) As defined in S-480-80, the PFM will fly on the EOS PM-1 spacecraft.

(b) The contractor shall provide the personnel, materials, and facilities necessary to accomplish the following tasks for the AMSU-A PFM:

(1) Procure and/or fabricate all required parts, components, subassemblies.

(2) Perform all required subsystem-level alignment, functional, performance, calibration, and qualification tests.

(3) Perform the systems assembly/integration.

(4) Perform all required system-level alignment, functional, performance, calibration, and qualification tests necessary to demonstrate full compliance with Specification S-480-80. Provide digital data records of all recorded instrument output.

(5) Perform the required final acceptance test of the PFM.

(6) Prepare the required test documentation (pre- and

post-test).

(7) If refurbishment of the PFM is necessary, provide the required retesting (identify elements) and calibration support to make it flight quality.

2.4 METSAT FLIGHT MODEL-7

(a) The FM-7, defined in S-480-80, will fly on the METOP-2 spacecraft.

(b) The contractor shall provide the personnel, materials, and facilities necessary to accomplish the following tasks for the AMSU-A FM(s):

(1) Procure and/or fabricate all required parts, components, subassemblies.

(2) Perform all required subsystem-level alignment, functional, performance, calibration, and development acceptance tests.

(3) Perform the systems assembly/integration.

(4) Perform all required system-level alignment, functional performance, calibration, and acceptance tests necessary to demonstrate full compliance with the Specification S-480-80. Collect and maintain digital data records of all recorded instrument output.

(5) Perform the required final acceptance test of the FM(s).

2.5 METSAT FLIGHT MODEL-3

(a) The FM-3, defined in S-480-80, will fly on the NOAA spacecraft.

(b) The contractor shall provide the personnel, materials, and facilities necessary to accomplish the following tasks for the AMSU-A FM(s):

(1) Procure and/or fabricate all required parts, components, subassemblies.

(2) Perform all required subsystem-level alignment, functional, performance, calibration, and development acceptance tests.

(3) Perform the systems assembly/integration.

(4) Perform all required system-level alignment, functional performance, calibration, and acceptance tests necessary to demonstrate full compliance with the Specification S-480-80. Collect and maintain digital data records of all recorded instrument output.

(5) Perform the required final acceptance test of the FM(s).

2.6 METSAT FLIGHT MODEL-4

(a) The FM-4, defined in S-480-80, will fly on the NOAA spacecraft.

(b) The contractor shall provide the personnel, materials, and facilities necessary to accomplish the following tasks for the AMSU-A FM(s):

(1) Procure and/or fabricate all required parts, components, subassemblies.

(2) Perform all required subsystem-level alignment, functional, performance, calibration, and development acceptance tests.

(3) Perform the systems assembly/integration.

(4) Perform all required system-level alignment, functional performance, calibration, and acceptance tests necessary to demonstrate full compliance with the Specification S-480-80. Collect and maintain digital data records of all recorded instrument output.

(5) Perform the required final acceptance test of the FM(s).

2.7 METSAT FLIGHT MODEL-5 (Mod 71)

(a) The FM-5, defined in S-480-80, will be built as a spare for the NOAA/METOP spacecraft.

(b) The contractor shall provide the personnel, materials, and facilities necessary to accomplish the following tasks for the AMSU-A FM(s):

(1) Procure and/or fabricate all required parts, components, subassemblies.

(2) Perform all required subsystem-level alignment, functional, performance, calibration, and development acceptance tests.

(3) Perform the systems assembly/integration.

(4) Perform all required system-level alignment, functional performance, calibration, and acceptance tests necessary to demonstrate full compliance with the Specification S-480-80. Collect and maintain digital data records of all recorded instrument output.

(5) Perform the required final acceptance test of the FM(s).

2.8 METSAT FLIGHT MODEL-6

(a) The FM-6, defined in S-480-80, will fly on the METOP-1 spacecraft.

(b) The contractor shall provide the personnel, materials, and facilities necessary to accomplish the following tasks for the AMSU-A FM(s):

(1) Procure and/or fabricate all required parts, components, subassemblies.

(2) Perform all required subsystem-level alignment, functional, performance, calibration, and development acceptance tests.

(3) Perform the systems assembly/integration.

(4) Perform all required system-level alignment, functional performance, calibration, and acceptance tests necessary to demonstrate full compliance with the Specification S-480-80. Collect and maintain digital data records of all recorded instrument output.

(5) Perform the required final acceptance test of the FM(s).

2.9 INSTRUMENT GROUND SUPPORT EQUIPMENT AND FIXTURES FOR EOS

The contractor shall provide the personnel, materials and facilities necessary to define detailed IGSE hardware and software requirements to satisfy the specification. A IGSE lead

engineer and a software lead engineer shall be assigned to the program through the checkout of the System Test Equipment (STE). The contractor shall design, produce, document, and maintain all IGSE
hardware and software. The IGSE includes the STE, all IGSE software, calibration equipment (including calibration and test fixtures), spacecraft mounting templates, expendable materials, storage containers, and other necessary supporting equipment and fixtures.

2.10 INSTRUMENT GROUND SUPPORT EQUIPMENT AND FIXTURES FOR METSAT

The contractor shall provide the personnel, materials and facilities, necessary to fabricate, test and calibrate the fixtures, spacecraft mounting templates, black body targets and monitors for spacecraft, STE (with TIROS interfaces), and shipping containers. The detailed designs of these shall be identical to those originally developed under NAS5-29402. Other supporting equipment and fixtures as necessary shall be transferred from the NAS5-29402 for use on this METSAT contract.

2.10.1 STE Configuration (Mod 51)

To support AMSU-A instruments at spacecraft integration facilities and have an appropriate backup flexibility the AMSU-A STE shall be configured as follows:

MICRO VAX 1	METSAT capability only
MICRO VAX 2	METSAT capability only
MICRO VAX 3	METSAT capability only
VAX 4000 4	METSAT, EOS, and METOP capability
VAX 4000 5	METSAT, EOS, and METOP capability
VAX 4000 6	METSAT, EOS, and METOP capability
VAX 4000 7	METSAT, EOS, and METOP capability

2.11 PERFORMANCE ASSURANCE

The contractor shall provide the personnel, materials, and facilities necessary to develop, implement, and maintain a Performance Assurance System consistent with the requirements of the EOS/METSAT Performance Assurance Requirements (PAR) document S-480-79. A Quality Assurance Engineer shall be assigned to the program. The contractor shall develop, implement, document, and monitor system safety, parts control, and materials and process control programs. The contractor shall implement a reliability program in accordance with the PAR. The contractor shall also establish, document, and implement a quality assurance program in accordance with the PAR.

2.12 SPACECRAFT INTEGRATION LAUNCH AND ON ORBIT SUPPORT POES/MetOp

(a) The contractor shall provide technical support for the AMSU-A flight models from shipment from the contractor's facility through spacecraft launch. The contractor shall also provide technical support for anomaly investigation for all flight models on operational POES, MetOp, and EOS Aqua spacecraft. CCR 4006R1 MOD 112

The contractor shall provide personnel and facilities necessary for supporting integration and test activities at both the contractor's plant and/or the spacecraft integration facility, including instrument bench checkout, providing technical support during integration of the instrument to the spacecraft, performing all required repairs and retests, conducting electrical system checkout following integration, and supporting environmental spacecraft level testing when the AMSU-A1/2 units are being operated. During spacecraft integration and testing, 1) investigation of discrepancy reports opened at the spacecraft vendor, 2) investigation of anomalous behavior of delivered instruments, and 3) response to action items shall be performed under the basic contract.

The total hours for ground anomaly investigations, including any anticipated travel, and on orbit anomaly investigations shall be limited to 3,500 hours per calendar year under the basic contract.

Any additional anomaly investigation support that exceeds the 3,500 hrs/yr, either as a result of ground testing or on-orbit performance, will be accomplished as specified in paragraph 2.12(c).

For each on-orbit anomaly, the contractor shall perform an on orbit evaluation of the instrument. Both engineering and science telemetry shall be included in the evaluation and the performance compared to ground test data and specifications. CCR 4006R1 MOD 112

During spacecraft integration testing at the POES spacecraft contractor’s facility in Sunnyvale, CA, technical support for any anomaly investigation shall be provided within three business days. The contractor shall arrange for and perform travel for anomaly investigations that require on-site support at the spacecraft contractor’s facility. This support shall

be provided under the basic contract as part of the anomaly investigation work.

During spacecraft integration testing at the MetOp spacecraft contractor's facility in Europe, technical support for any anomaly investigation shall be provided, nominally, within five business days. The contractor shall arrange for and perform travel for anomaly investigations that require on-site support at the spacecraft contractor's facilities. This support shall be provided under the basic contract as part of the anomaly investigation work.

During NOAA launch call up testing at the Western Test Range (WTR), the contractor shall provide support for anomaly investigation within one calendar day. The contractor shall arrange for and perform travel for anomaly investigations that require on-site support at the POES launch facility. This support shall be provided under the basic contract as part of the anomaly investigation work.

During MetOp launch call up testing at the MetOp launch site, the contractor shall provide support for anomaly investigation within five calendar days. The contractor shall arrange for and perform travel for anomaly investigations that require on-site support at the MetOp launch facilities. This support shall be provided under the basic contract as part of the anomaly investigation work.

Support shall be provided at the spacecraft vendor facility for the following activities for NOAA-N, NOAA-N', and MetOp-1, 2, 3. 1) Thermal Vacuum testing, 2) EMI testing, 3) pre-ship spacecraft testing, 4) Yearly storage inspections and spacecraft testing, 5) Pre-ship inspection and optical cleaning of instruments. For each test, the contractor shall provide an evaluation of the performance of the AMSU-A1/2. Preliminary results shall be available prior to the contractor leaving the test site. Results of each test shall be formally documented in a test report to be submitted 30 calendar days following the completion of each test. The test report shall include a summary of the test performed, how the instruments were evaluated, and a summary of the instruments' performance, including any anomalous behavior.

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The government will provide schedules in sufficient time to permit appropriate planning for test support. If test support between MetOp and NOAA overlaps, the government will designate which test has priority. The review of the test results of the lower priority test can wait until the higher priority test is complete.

Launch And On-Orbit Activation

(1) Support NOAA-L, M, N and N' Launch and on orbit Activation activities.

(2) Support MetOp-1 and -2 Launch and on orbit activation activities

(3) Advise the Government and the spacecraft contractors on the instrument's flight readiness during all stages of the spacecraft program.

(4) Monitor on-orbit instrument performance once a month for general instrument health and performance.

(5) Technical support shall be provided for instrument performance evaluation at the contractor's facility during the on-orbit operational life of the instruments or the end of the contract period of performance (see contract clause F.6), whichever is sooner. This on-orbit technical support shall be performed through support orders as specified in paragraph 2.12(c).

Other Reports

- Monthly Activity Report (including Financial Data).
- Other CDRLs as required.

o Storage: The contractor shall be capable of maintaining and storing two completed AMSU-A instrument sets including all special test equipment, ground support equipment, spare parts, components and assemblies and any other associated equipment. Responsibilities shall include but not be limited to the following:

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(1) Store and periodically test the completed instruments remaining in storage either at the contractor's facilities or spacecraft contractor's facilities.

(2) Store and maintain spare parts and assembly inventories.

(3) Store and maintain all instrument support equipment including MGSE, IGSE and STE at either the contractor's facilities or spacecraft contractor facilities.

(c) The following work shall be performed per CO directions. The CO shall provide specific instructions to the contractor concerning the exact scope of the work to be performed, in accordance with contract clause H.20.

(1) The contractor shall support ground and on orbit anomalies for NOAA, POES, MetOp, and Aqua spacecraft under the basic contract up to the specified limits in paragraph 2.12(a). Any additional support beyond the limits specified in paragraph 2.12(a) shall be performed in accordance with contract clause H.20.

(2) For each on-orbit anomaly support order, the contractor shall perform an on orbit evaluation of the instrument. Both engineering and science telemetry shall be included in the evaluation and the performance compared to ground test data and specifications.

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(3) Perform any special analyses as required in support of POES spacecraft integration and test activities.

(4) Perform any EUMETSAT (MetOp) special analyses, tests or studies.

(5) Perform any special analyses as required in support of on orbit assets.

(d) MetOp Support: The contractor shall provide technical support for METOP AMSU-A GSE hardware and software interface testing. This support shall include interfacing the AMSU-A GSE with the METOP spacecraft data system to demonstrate proper operation. Support shall include modifications to hardware or software, if required, to facilitate proper operation.

2.13 FIELD SUPPORT

2.13.1 Field Support (Mod 84)

Aerojet shall provide AMSU-A instrument operations support for the Aqua mission in the form of an

Instrument Operations Team (IOT). Support shall be provided pre-launch in the form of operations development and post-launch in the form of responsibility for AMSU-A activation. This effort is in addition to the AMSU-A Instrument Engineering Team (IET) function of anomaly detection and resolution. Pre-launch operations development support shall include: developing AMSU-A on-orbit activities and constraints for inputs to the Aqua Integrated Mission Timeline and Planning and Scheduling System; providing on-orbit operations procedures; certifying ground command procedures; defining Telemetry Monitor (TMON) fault management groups; providing Out of Limit responses, and providing updates to the Project Database, if required. Additional pre-launch support requires participation in the Spacecraft Interface Tests from the GSFC EOC as well as key Flight Team Simulations and Mission Rehearsals.

Post-launch support shall require participation at the GSFC EOC during the Launch and Early Orbit portion of the mission. The IOT shall be responsible for all AMSU-A activities, providing GO/NO-GO calls as necessary. The IOT shall be present for all AMSU-A command activities and be available during non-command periods. The IOT shall also be responsible for data analysis, instrument performance trending, and anomaly investigation. Responsibility ceases when AMSU-A is deemed operational.

2.14 CRITICAL SPARES INVENTORY

(a) To the maximum extent possible the contractor should take advantage of the synergism of the EOS and POES AMSU-A instruments. To this extent this spares program is to be combined.

(b) The contractor shall define and implement the spares program necessary to minimize schedule impact created by subsystem failures, by contamination, or by other plausible events or conditions. The spares shall be available immediately for replacing portions of the PFM to minimize schedule slips and to preclude interruptions in the development and test cycles. In defining the spares program, the contractor shall consider the reliability, handling, and environment of subsystems, components, and parts, hence the likelihood that these items would need to be replaced. The spares, in quantities to be defined by the contractor, shall be qualified, tested and calibrated to the same standards as the flight instrument articles, and shall

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be certified as flight ready. The spares shall be available immediately for replacing portions of the instrument to minimize schedule slip. Some may remain at the contractor's facility, some may be sent to the spacecraft contractor's facility. Any remaining spares at the conclusion of the contract shall be shipped to NASA GSFC.

2.15 STORAGE OF SHIP IN PLACE INSTRUMENTS AND GSE

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The contractor shall be responsible for providing facilities and safe storage (including periodic testing if required by Operations & Maintenance Manuals) of instruments and GSE until time of shipment. The contractor shall be responsible for packaging of the instruments and covered under clause F.4 (F.O.B. Destination) and those instruments and support equipment that shall be shipped on G.B.L.

3.0 REQUIRED PLANS AND OTHER DOCUMENTS

The contractor shall provide documentation, including plans and review data packages, math models and analyses, engineering and test reports, specifications and operations documents, procedures and other data as required by the CDRL, Attachment E of the contract.

4.0 REVIEWS AND MEETINGS

4.1 PROJECT INITIATION MEETING

This meeting shall serve to review and discuss the contractor's program plans. It shall be held at the Contractor's Facility (CF) at the start of the implementation phase of the contract.

4.2 DESIGN CONCEPT REVIEW

This review shall describe in depth the contractor's conceptual design, including analyses conducted, rationales for tradeoffs made, system margins for requirements including sensitivity, polarization insensitivity, stability and calibration. This review shall be at GSFC.

4.3 QUARTERLY STATUS REVIEWS

Quarterly technical and cost reviews will be held at the CF. These reviews will detail planned versus actual accomplishments for the prior 3 month period. For technical, cost, manpower and PMS performance, a detailed 12 month rolling-wave (3 months of

actual plus 9 months forecast) will be maintained and statused at each review, along with verification of the balance of the work to be performed.

4.4 PMS COMPLIANCE REVIEW

The purpose of this review is to allow the GSFC team to evaluate the contractor's management system in operation for compliance with the criteria. The review will also demonstrate the use and understanding of the system by all levels of management.

It shall be held at the CF. Follow-up reviews may be required to assess actions taken to correct deficiencies.

4.5. SOFTWARE REQUIREMENTS/PRELIMINARY DESIGN REVIEW

This review shall cover the initial software design activity, by which time all fundamental software design issues will have been resolved. It shall be held at the CF.

4.6 PRELIMINARY DESIGN REVIEW

This review shall cover the initial Phase C/D design activity,
by which time all fundamental design issues shall have been resolved. It shall be held at the CF.

4.7 SOFTWARE CRITICAL DESIGN REVIEW

This review shall cover the software design as it exists in the early stages of hardware design activity. It shall identify areas of the software design which may be affected by ongoing hardware studies. It shall be held at the CF.

4.8 CRITICAL DESIGN REVIEW

This review shall cover the final design of the instrument. The review shall demonstrate that the instrument, as designed, meets the instrument specification, and that the design is complete, mature, and ready for the implementation phase. It shall also review breadboard and engineering test results. It shall be held at the CF. This design review will be held in accordance with the milestone schedule.

4.9 CALIBRATION PEER REVIEW 1

This review shall provide the contractor's detailed calibration scenario to AMSU-A team scientists and to the Government, including descriptions of planned calibration

equipment and facilities. It shall address calibration accuracies. It shall be held near the time of the preliminary design review, at GSFC.

4.10 DELETED

4.11 SOFTWARE TEST READINESS REVIEW

This review shall cover the software design just prior to the start of comprehensive environmental testing. The review shall cover the plan for verifying correct software operability during PFM testing. It shall be held at the CF.

4.12 PRE-ENVIRONMENTAL TEST REVIEWS

Prior to subjecting an EOS PFM or the METSAT FMs to environmental testing (including thermal vacuum testing) a formal review shall be conducted to determine readiness for the testing. It shall be held at the CF. These reviews will be held separately in accordance with the milestone schedule.

4.13 SOFTWARE ACCEPTANCE REVIEW

This review shall cover the final software design. It shall include a complete summary of the changes made since the software CDR. It shall summarize the software verification procedures and results. It shall be held at the CF.

4.14 METOP ACCOMMODATION DESIGN REVIEW FOR GSE CHANGES (Mod 51)

This review shall present the design required to meet METOP software and hardware requirements.

4.15 PRE-SHIPMENT REVIEWS

A review of the history and status of an EOS PFM or METSAT FMs shall be held before it is shipped to the spacecraft contractor. It shall be held at the CF. These reviews will be held separately in accordance with the milestone schedule. If the METSAT Engineering Model needs to be shipped to the METOP spacecraft integrator a Pre-Ship Review will be held. This review will document all interface discrepancies relative to the UIIS and provide current instrument performance characteristics.

4.16 MANUFACTURING PROCESS AND DESIGN DOCUMENTATION "BASELINE REVIEW"

An extensive review of all AMSU-A drawings procurement specifications, shop orders, and test procedures shall be conducted in order to establish the EOS/METSAT instrument baseline. From the "baseline" drawings, procurement specifications, shop orders and test procedures that need to be modified or newly created will be identified and presented as a milestone to the program schedule. This review shall be conducted in small groups of engineers with NASA representative in attendance. A report will delineate the findings of this review. All identified modifications and new documentation shall be accomplished prior to the CDR.

4.17 MANUFACTURING READINESS REVIEW

An extensive manufacturing readiness review shall be conducted prior to the beginning of hardware manufacture. All subsystems shall be reviewed starting at the lowest manufacturing level (review shall be done drawing by drawing). The most current manufacturing flow plan will be reviewed for accuracy and completeness. All procedures used for qualification of the instrument shall be reviewed. The review shall be conducted in small groups of engineers with NASA representative in attendance. A report will delineate the findings of this review and outstanding actions shall be identified. The results of the review shall demonstrate manufacturability of the AMSU-A instruments. Manufacturing will not begin until all action items have been satisfactorily resolved.

4.18 MONTHLY STATUS MEETINGS

Informal status meetings will be held at the CF monthly. The format of the meeting will be based on current available data that Project Management uses in the day to day activities. Formal presentations are not required. The meetings are anticipated to require one to two days and will be attended by approximately 1-2 Government personnel. Information presented at these reviews shall be subdivided into EOS and METSAT subsections and shall include:

(a) Technical Status - A description of significant work done during the period and continuing discussion of problem areas and plans.

(b) Schedule Status - The Network Schedule shall be shown along with critical path(s). These schedules shall be discussed, along with other milestone evaluations from the written monthly report.

(c) Financial Status - A thorough discussion of the PMS

report shall be held.

Each monthly review shall be scheduled well ahead of time and shall be conducted as early as possible after availability of the monthly reports. It is anticipated that the PMS report availability will be the controlling factor.

4.19 SPECIAL MEETINGS

Other occasional special status meetings shall be required at GSFC, or at LM-Astro, Hightstown NJ (or Sunnyvale CA), or at the EOS PM spacecraft contractor facility, and at the METOP spacecraft contractor facility.